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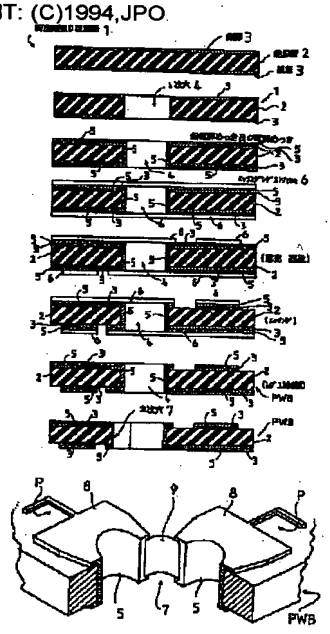
(54) MANUFACTURE PRINTED WIRING BOARD PROVIDED WITH THROUGH-HOLE

(57) Abstract:

PURPOSE: To realize a printed wiring board provided with through-holes which can be connected together by a method wherein a plating layer formed on the inner wall of the through-hole is split into pieces by an insulator.

CONSTITUTION: A copper foil 3 is pasted on both the sides of an insulating layer 2 for the formation of a copper-plated laminate board, through-holes are provided to the laminate board 1 partially overlapping each other to form a primary hole (through-hole) 4, a copper plating layer is formed on the inner wall of the primary hole 4 and the surface of the copper foil 3 through electroless copper plating, and furthermore a copper plating layer 5 is formed on the upside of the copper plating layer. The copper plating layer 5 is formed uniform in thickness, a photosensitive etching resist, film 6 is laminated thereon, exposed to light, and developed, and the unexposed and undeveloped film 6 is removed, and the disused copper plating layer 5 and the disused copper foil 3 are removed. Therefore, the film 6 left unremoved on a circuit pattern is separated off, and the edge of the overlap of the primary hole 4 where through-holes overlap each other is cut off through a secondary hole processing, whereby four insulating sections 9 are formed, and four circuit patterns P on each side of the laminate board 1 are connected to each other.



CLAIMS

[Claim(s)]

[Claim 1] The through hole formation process which is made to carry out the lap of a part of both [two or more] breakthroughs to the body of a patchboard, and forms a through hole, The plating process which forms the plating layer of a metallic conductor in the inner circle wall of said through hole, The circuit pattern formation process which forms in both sides of said body of a patchboard two or more circuit patterns mutually connected through the plating layer of said through hole, The manufacture method of a printed wired board of having the through hole which consists of a removal process which removes the edge of the lap section between each breakthrough in said through hole.

[Claim 2] The through hole formation process which is made to carry out the lap of a part of both [two or more] breakthroughs to the body of a patchboard, and forms a through hole, The plating catalyst grant process which gives a nonelectrolytic plating catalyst to the body of a patchboard with which said through hole was formed, The removal process which removes the nonelectrolytic plating catalyst which exists in an edge by removing the edge of the lap section between each breakthrough in said through hole, While forming the plating layer of a metallic conductor in the inner circle wall of a through hole with nonelectrolytic plating except for the edge where said nonelectrolytic plating catalyst was removed The manufacture method of a printed wired board of having the through hole which consists of a nonelectrolytic plating process which forms in both sides of said body of a patchboard two or more circuit patterns mutually connected through the plating layer of a through hole.

[Claim 3] The through hole formation process which is made to carry out the lap of a part of both [two or more] breakthroughs to the body of a patchboard, and forms a through hole, The plating process which forms the plating layer of a metallic conductor in the inner circle wall of said through hole, The circuit pattern formation process which forms in both sides of said body of a patchboard two or more circuit patterns mutually connected through the plating layer of said through hole, While laminating prepreg to both sides of said body of a patchboard, being filled up with the inside of said through hole The manufacture method of a printed wired board of having the through hole which consists of a multilayering process which sticks copper foil on laminated both sides of prepreg, and a removal process which removes the edge of the lap section between each breakthrough in said through hole.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] If this invention is in a double-sided printed wiring board especially about the manufacture method of a printed wired board of having a through hole [two or more circuit patterns of each formed in the top face of a printed wired board, and two or more circuit patterns of each formed in an underside] respectively separately independently again if it is in a multilayer printed wiring board Between the circuit patterns of up-and-down both sides and between the circuit pattern of up-and-down both sides and an interlayer's circuit patterns are related with the manufacture method of a printed wired board of having a respectively separate mutually connectable independently through hole.
[0002]
[Description of the Prior Art] Conventionally, various kinds of printed wired boards which have a through hole are proposed, and in this printed wired board [a through hole] It is used as a means to connect mutually each circuit pattern generally formed in up-and-down both sides if it was in the double-sided printed wiring board. Moreover, in the multilayer printed wiring board, both the circuit patterns of up-and-down both sides are connected, and it is used as a means to connect the circuit pattern of up-and-down both sides, and an interlayer's circuit pattern mutually. And in said each printed wired board, it connects mutual for two circuit patterns formed in the exception layer of one through hole, respectively.
[0003] However, if a connectable circuit pattern is restricted to two through one through hole in this way, when many circuit patterns exist on a patchboard, in order to connect each circuit patterns of both, it is necessary to form many through holes in a patchboard. In this case, although it is good to gather and to form two or more through holes on a patchboard on the design of a circuit pattern Since the land pattern is usually formed in the perimeter of a through hole, around the part in which through holes including a land pattern are formed, the field which cannot form a circuit pattern will occur inevitably. Since the pulse duty factor which a circuit pattern becomes complicated, becomes larger as the number of through holes increases, and is occupied to a patchboard increased, the area of this field was that in which a problem remains still more on wiring of a circuit pattern.
[0004] In order to solve such a problem, the method of producing the function to form the insulating section that the conductor plating formed in the inner circle wall of a through hole should be divided into plurality in recent years, and to connect many circuit patterns to one through hole is developed. for example, [JP,H4-120262,U] The printed circuit board which connected two or more circuit patterns of both that formed two or more plating sections divided by preparing the path clearance section (insulating section) in a BAIA hole (through hole), and were formed in up-and-down both sides of a printed circuit board through each plating section is indicated. and as a method of forming the path clearance section in a BAIA hole When galvanizing in a BAIA hole, after galvanizing all over the method of applying the ingredient which can prevent formation of a plating layer, and the inner surface of a BAIA hole, the method of irradiating a laser beam etc. and deleting a plating layer is adopted.
[0005]
[Problem to be solved by the invention] however, [the method of the former indicated to said JP,H4-120262,U] It is very difficult to plaster the inner surface of a BAIA hole with ingredients, such as plating resist, according to the width equivalent to path clearance, and it is only a very unreal method

in the actual condition that a circuit pattern is complicated increasingly and the path of the BAIA hole is small.

[0006] Moreover, although it is thought possible by the above mentioned latter method to carry out fusion clearance of the plating layer formed in the BAIA hole inner surface in the laser beam, exposure control of a laser beam will become very complicated, and a possibility of inviting high cost-ization of a patchboard as a result will consist much.

[0007] By making this invention in order to cancel the trouble of said conventional technology, insulating the plating layer formed in a through hole inner circle wall by a very easy method, and dividing a plating layer into plurality Two or more circuit patterns of each formed in the top face of a printed wired board if it is in a double-sided printed wiring board, and two or more circuit patterns of each formed in an underside respectively separately independently Moreover, if it is in a multilayer printed wiring board, it aims at offering the manufacture method of a printed wired board of having a respectively separate mutually connectable independently through hole between the circuit patterns of up-and-down both sides, and for between the circuit pattern of up-and-down both sides, and an interlayer's circuit patterns.

[0008]

[Means for solving problem] In order to attain said object [invention according to claim 1] The through hole formation process which is made to carry out the lap of a part of both [two or more] breakthroughs to the body of a patchboard, and forms a through hole, The plating process which forms the plating layer of a metallic conductor in the inner circle wall of said through hole, It has composition which consists of a circuit pattern formation process which forms in both sides of said body of a patchboard the circuit pattern mutually connected through the plating layer of said through hole, and a removal process which removes the edge of the lap section between each breakthrough in said through hole.

[0009] Moreover, the through hole formation process which invention according to claim 2 makes carry out the lap of a part of both [two or more] breakthroughs to the body of a patchboard, and forms a through hole, The plating catalyst grant process which gives a nonelectrolytic plating catalyst to the body of a patchboard with which said through hole was formed, The removal process which removes the nonelectrolytic plating catalyst which exists in an edge by removing the edge of the lap section between each breakthrough in said through hole, While forming the plating layer of a metallic conductor in the inner circle wall of a through hole with nonelectrolytic plating except for the edge where said nonelectrolytic plating catalyst was removed It has composition which consists of a nonelectrolytic plating process which forms in both sides of said body of a patchboard the circuit pattern mutually connected through the plating layer of a through hole.

[0010] Furthermore, the through hole formation process which invention according to claim 3 makes carry out the lap of a part of both [two or more] breakthroughs to the body of a patchboard, and forms a through hole, The plating process which forms the plating layer of a metallic conductor in the inner circle wall of said through hole, The circuit pattern formation process which forms in both sides of said body of a patchboard two or more circuit patterns mutually connected through the plating layer of said through hole, While laminating prepreg to both sides of said body of a patchboard, being filled up with the inside of said through hole, it has composition which consists of a multilayering process which sticks copper foil on laminated both sides of prepreg, and a removal process which removes the edge of the lap section between each breakthrough in said through hole.

[0011]
[Function] In invention of Claim 1 which has said composition, first, the lap of a part of both [two or more] breakthroughs is carried out to the body of a patchboard, and a through hole is formed. Then, while the plating layer of a metallic conductor is formed in the inner circle wall of a through hole, two or more circuit patterns linked to the plating layer of a through hole are formed in both sides of the body of a patchboard. And the edge of the lap section between each breakthrough in a through hole is removed, and the printed wired board which has a through hole by this is manufactured. At this time, by removing an edge in a plating layer in a through hole, the insulating section will be formed and the plating layer in a through hole is divided into plurality from this. As a result, two or more circuit patterns of each formed in both sides of the body of a patchboard are mutually connected through two or more plating layers of each divided in the through hole.
[0012] Moreover, in invention of Claim 2, after carrying out the lap of a part of both [two or more] breakthroughs to the body of a patchboard and forming a through hole, a nonelectrolytic plating catalyst is given to the interior of a through hole, and the body of a patchboard. Next, when the edge of the lap section between each breakthrough in a through hole removes, the nonelectrolytic plating catalyst which exists in an edge is removed. At this time, the part in which a nonelectrolytic plating catalyst exists will be discontinuously formed in a through hole through the edge where the nonelectrolytic plating catalyst was removed. Then, except for the edge where the nonelectrolytic plating catalyst was removed as mentioned above, the plating layer of a metallic conductor is formed in the inner circle wall of a through hole by nonelectrolytic plating. Since a plating layer is selectively formed in the part in which the nonelectrolytic plating catalyst which exists discontinuously in a through hole exists, without forming a plating layer in the edge where the nonelectrolytic plating catalyst is removed in this state In a through hole, two or more plating layers will exist by making into the insulating section the edge in which a plating layer is not formed. And two or more circuit patterns simultaneously connected mutually through two or more plating layers of each formed in the through hole are formed in both sides of the body of a patchboard.
[0013] Furthermore, in invention of Claim 3, first, the lap of a part of both [two or more] breakthroughs is carried out to the body of a patchboard, and a through hole is formed. Then, while the plating layer of a metallic conductor is formed in the inner circle wall of a through hole, two or more circuit patterns linked to the plating layer of a through hole are formed in both sides of the body of a patchboard. And copper foil is stuck on both sides of the laminated prepreg while prepreg is laminated by both sides of the body of a patchboard, being filled up with the inside of a through hole. Thereby, multilayering of a printed wired board is performed. Furthermore, after this, the edge of the lap section between each breakthrough in a through hole is removed, and the printed wired board which has a through hole by this is manufactured. thus, [fill / in a through hole / with resin of prepreg / in a multilayering process] when removing the edge of the lap section It becomes possible to remove the edge of the lap section, without [without it carries out like the packer of resin into a through hole separately, and] the plating layer of a metallic conductor exfoliating at the edge of the lap section, or producing weld flash etc. By passing through said each process, by removing an edge in a plating layer in a through hole, the insulating section will be formed and the plating layer in a through hole is divided into plurality from this. As a result, two or more circuit patterns of each formed in both sides of the body of a patchboard, and these circuit patterns and an interlayer's circuit pattern formed of multilayering are mutually connected through two or more plating layers of each divided in

the through hole.

[0014]

[Working example] It explains to a detail, referring to Drawings hereafter based on the example which materialized this invention. First, the manufacture method concerning the 1st example is explained with reference to drawing 1 or drawing 4 . Drawing 1 is process drawing showing the manufacture method of a printed wired board based on the subtractive process concerning the 1st example, and prepares the double-sided copper-clad laminate 1 first cut out to the prescribed dimension as shown in process (b). The double-sided copper-clad laminate 1 sticks copper foil 3 on up-and-down both sides of an insulating layer 2 so that it may be well-known.

[0015] Next, the primary hole (through hole) 4 is formed in process (**), carrying out the lap of a part of two or more breakthroughs to the copper-clad laminate 1. This primary hole processing is explained based on drawing 2 . Drawing 2 is the primary hole 4 formed in the copper-clad laminate 1 of primary hole processing a shown top view, and [this primary hole 4] As shown in drawing 2 , it is punctured by forming four round holes C1, C2, C3, and C4 in the copper-clad laminate 1 first, so that the perimeter of each round hole C1, C2, C3, and C4 may touch mutually through a drill, and forming a round hole C5 in the center section of each round hole C1, C2, C3, and C4 after this. Then, in process (c), after performing washing of the counter etching of the primary hole 4, and a hole wall, a copper-plating layer is formed in the inner circle wall of the primary hole 4, and the top face of each copper foil 3 with non-electrolytic copper plating. And the copper-plating layer 5 is further formed in the top face of the copper-plating layer formed by nonelectrolytic plating through electrolytic copper plating, and equalization of the thickness of the copper-plating layer 5 in the primary hole 4 and the thickness of the copper-plating layer 5 formed in each copper foil 3 is attained. This state is shown in process (c).

[0016] Furthermore, in process (d), the photosensitive etching resist film 6 is laminated on each copper-plating layer 5 formed in both sides of the copper-clad laminate 1. Then, a predetermined circuit pattern is followed in process (e), exposure and development of the etching resist film 6 are performed, and the etching resist film 6 which is not exposed and developed is removed. As shown at process (e) on the copper-plating layer 5 formed in both sides of the copper-clad laminate 1 at this event, the etching resist film 6 is left behind to the top face of the copper-plating layer 5 which should be made to remain as a circuit pattern.

[0017] Next, in process (**), etching processing is performed that the copper-plating layer 5 and copper foil 3 unnecessary as a circuit pattern should be removed, and the etching resist film 6 which remains further on the circuit pattern formed in both sides of the copper-clad laminate 1 as mentioned above in process (g) is exfoliated. Thereby, while a predetermined circuit pattern is formed in both sides of the copper-clad laminate 1, printed wired board PWB by which each circuit pattern was mutually connected through the copper-plating layer 5 formed in the inner circle wall of the primary hole 4 is obtained.

[0018] And secondary hole processing is performed that printed wired board PWB manufactured as mentioned above should excise the edge of the lap section which carries out a lap mutually in the primary hole 4 in process (h). This secondary hole processing is explained with reference to drawing 3 . Drawing 3 is the top view showing the secondary hole formed in printed wired board PWB of secondary hole processing. Secondary hole processing is performed by forming a round hole C6 in order to excise each mutual lap section L of the primary hole 4 formed as mentioned above through a

drill (it has a path thicker than the drill used for primary hole processing). The secondary hole (through hole) 7 from which it comes to excise the lap section L by this is formed. Thus, when performing secondary hole processing, after filling up the interior of the primary hole 4 with conductive ingredients, such as insulating resin and solder, it is desirable to drill a round hole C6 with a drill. If it does in this way, when forming a round hole C6, the copper-plating layer 5 currently formed in the inner circle wall of the secondary hole 7 can exfoliate from an inner circle wall, or it can prevent certainly that weld flash etc. occurs.

[0019] Printed wired board PWB manufactured by passing through said each process (b) or process (h) is explained based on drawing 4 . Drawing 4 is the perspective view of printed wired board PWB in which cutting and lacking a part of secondary hole 7 in printed wired board PWB, and showing it typically. [the copper-plating layer 5 formed in said process (c) in the inner circle wall of the secondary hole 7] By having excised the lap section L by secondary hole processing performed in said process (**), the four insulating sections 9 (only the one insulating section 9 is shown in drawing 4) are formed, and, as a result, the copper-plating layer 5 of the inner circle wall of the secondary hole 7 will be divided into four parts. moreover, [up-and-down both sides of printed wired board PWB] Four circuit patterns P which have the land 8, respectively are formed (in drawing 4). Two circuit patterns P each with which only two circuit patterns P are shown in the top face, and four circuit patterns P are similarly formed in the rear face and which can be set up and down are mutually connected through each of the copper-plating layer 5 divided as mentioned above.

[0020] Four conduction passages (copper-plating layer 5) can be prepared by this in one secondary hole 7 (through hole) formed in printed wired board PWB. This result, Since the circuit pattern P of four upper and lower sides each in printed wired board PWB is mutually connectable through one secondary hole 7 The occupying area which the number of the through holes which should be formed in printed wired board PWB is decreased on the whole, and a through hole occupies to printed wired board PWB can be made very small.

[0021] Next, the manufacture method of the printed wired board concerning the 2nd example of this invention is explained based on drawing 5 and drawing 6 . Drawing 5 is process drawing showing the manufacture method of a printed wired board based on the additive process concerning the 2nd example. First, the three-layer laminate 10 which laminates an insulating layer 11B further is prepared for both sides of the insulating layer 11A which formed the predetermined circuit pattern Q1 (it becomes an inner layer circuit pattern) in up-and-down both sides in the process (A). At this event, copper foil does not exist in both sides of the three-layer laminate 10.

[0022] Next, spreading formation of the adhesives layer 12 for nonelectrolytic plating is carried out to both sides of the three-layer laminate 10 at a process (B). Then, in a process (C), primary hole processing for through holes is performed. The same processing as processing to which this primary hole processing was carried out by process (**) in the last 1st example is performed (refer to drawing 2). That is, it is carried out by forming four round holes C1, C2, C3, and C4 in the three-layer laminate 10 so that the perimeter of each round hole C1, C2, C3, and C4 may touch mutually through a drill, and forming a round hole C5 in the center section of each round hole C1, C2, C3, and C4 after this. The primary hole 13 is formed of this primary hole processing. Furthermore, after the primary hole 13 is formed in this way, the nonelectrolytic plating catalyst nucleus which becomes both sides of the three-layer laminate 10 and the inner circle wall of the primary hole 13 from palladium is given.

[0023] this -- then, a photosensitive plating resist film is laminated to both sides of the three-layer

laminate 10 at a process (D), the configuration of a further predetermined circuit pattern is followed, and a plating resist film is exposed and developed. Then, exfoliation clearance of the plating resist film of a part with which a circuit pattern is formed is carried out. Thereby, the plating resist 14 is obtained by the part which does not participate in formation of a circuit pattern in both sides of a laminate 10.

[0024] Furthermore, in a process (E), secondary hole processing is performed that the edge of the lap section which carries out a lap mutually in the primary hole 13 formed as mentioned above should be excised. This secondary hole processing is the same as processing performed in said 1st example (refer to drawing 3). That is, it is carried out by forming a round hole C6 in order to excise each mutual lap section L of the primary hole 13 through a drill (it has a path thicker than the drill used for primary hole processing), and the secondary hole (through hole) 15 from which it comes to excise the lap section L by this is formed. The plating catalyst nucleus given at the process (C) does not exist in the part (it becomes the insulating section so that it may mention later) from which the lap section L was excised as mentioned above in the secondary hole 15 at this event. In this back, activation of the plating catalyst nucleus given to both sides of a laminate 10 and the inner circle wall of the secondary hole 15 is performed.

[0025] And copper nonelectrolytic plating is performed in a process (F). While the predetermined circuit pattern Q2 is formed in the part which is not covered with plating resist on the laminate 10 by this, the plating layer 16 is formed in the part which is not excised in the secondary hole 15 at the time of secondary hole processing. As a result, laminating printed wired board PWB to which the circuit pattern Q1 which each circuit pattern Q2 and the plating layer 16 of the inner circle wall of the secondary hole 15 which were formed in the upper and lower sides of a laminate 10 are connected, and is formed in the interior of a laminate 10 through the plating layer 16 was connected is manufactured.

[0026] It explains referring to drawing 6 about laminating printed wired board PWB manufactured through said each process (A) or (F). Drawing 6 is the perspective view of printed wired board PWB in which cutting and lacking a part of secondary hole 15 in laminating printed wired board PWB, and showing it typically. [the copper-plating layer 16 formed at said process (F) in the inner circle wall of the secondary hole 15] By excising the lap section L by secondary hole processing performed at said process (E), and preparing the part to which the plating catalyst nucleus is not given The four insulating sections 17 (only the one insulating section 17 is shown in drawing 6) are formed, and, as a result, the copper-plating layer 16 of the inner circle wall of the secondary hole 15 will be divided into four parts. moreover, [up-and-down both sides of printed wired board PWB] Four circuit patterns Q2 which have the land 18, respectively are formed (in drawing 6). Only two circuit patterns Q2 are shown in the top face, and four circuit patterns Q2 are similarly formed in the rear face. Two circuit patterns Q2 each which can be set up and down, and the circuit pattern Q1 currently formed in the interior of a laminate 10 are mutually connected through each of the copper-plating layer 16 divided as mentioned above.

[0027] In this laminating printed wired board PWB By performing secondary hole processing, before the copper-plating layer 16 is formed in the inner circle wall of the secondary hole (through hole) 15 When secondary hole processing is performed without being filled up with resin etc. into the secondary hole 15 unlike the manufacture method of said 1st example, it can prevent certainly that exfoliation of the circuit pattern Q1 and weld flash occur at the time of division of the copper-plating

layer 16 formed in the inner circle wall of the secondary hole 15.
[0028] [according to the manufacture method of the laminating printed wired board which starts the 2nd example by the above mentioned place] Four conduction passages (copper-plating layer 16) can be prepared in one secondary hole 15 (through hole) formed in laminating printed wired board PWB. This result, Since the circuit pattern Q2 of four upper and lower sides each in printed wired board PWB is mutually connectable through one secondary hole 15 The occupying area which the number of the through holes which should be formed in printed wired board PWB is decreased on the whole, and a through hole occupies to printed wired board PWB can be made very small. [especially each copper-plating layer 16 divided into four] The circuit pattern Q2 of both sides of laminating printed wired board PWB, and both the circuit pattern Q1 currently formed in the interior of a laminate 10 and each circuit pattern Q1 of both currently formed in the interior of a laminate 10 can be connected If the area in which circuit formation is possible can be increased by leaps and bounds substantially, and it puts in another way by increasing one layer of number of layerses in laminating printed wired board PWB and wiring density is the same, the number of wiring layers can be reduced by adopting the method of the 2nd example.
[0029] Then, the manufacture method of the printed wired board concerning the 3rd example of this invention is explained based on drawing 7 or drawing 9 . It is process drawing showing the manufacture method of the multilayer printed wiring board which drawing 7 and drawing 8 require for the 3rd example here. This manufacture method is fundamentally the same as the manufacture method of the printed wired board in the 1st example, and [the manufacture method of the multilayer printed wiring board of the 3rd example] In the point that the formation process of a circuit pattern is further performed through a through hole in connection with a multilayering process and a multilayering process, it differs from the manufacture method of the 1st example. In drawing 7 and drawing 8 , the double-sided copper-clad laminate 21 first cut out to the prescribed dimension as shown in a process (1) is prepared. The double-sided copper-clad laminate 21 sticks copper foil 23 on up-and-down both sides of an insulating layer 22 so that it may be well-known.
[0030] Next, the primary hole (through hole) 24 is formed in a process (2), carrying out the lap of a part of two or more breakthroughs to the copper-clad laminate 21. The same processing as processing to which this primary hole processing was carried out by process (**) in said 1st example is performed (refer to drawing 2). That is, it is carried out by forming four round holes C1, C2, C3, and C4 in the double-sided copper-clad laminate 21 so that the perimeter of each round hole C1, C2, C3, and C4 may touch mutually through a drill, and forming a round hole C5 in the center section of each round hole C1, C2, C3, and C4 after this. The primary hole 24 is formed of this primary hole processing.
[0031] Then, at a process (3), after performing washing of the counter etching of the primary hole 24, and a hole wall, a copper-plating layer is formed in the inner circle wall of the primary hole 24, and the top face of each copper foil 23 with non-electrolytic copper plating. And the copper-plating layer 25 is further formed in the top face of the copper-plating layer formed by nonelectrolytic plating through electrolytic copper plating, and equalization of the thickness of the copper-plating layer 25 in the primary hole 24 and the thickness of the copper-plating layer 25 formed in each copper foil 23 is attained. This state is shown in the process (3).
[0032] Furthermore, in a process (4), the photosensitive etching resist film 26 is laminated on each copper-plating layer 25 formed in both sides of the copper-clad laminate 1. Then, a predetermined

circuit pattern is followed at a process (5), exposure and development of the etching resist film 26 are performed, and the etching resist film 26 which is not exposed and developed is removed. As shown in a process (5) on the copper-plating layer 25 formed in both sides of the copper-clad laminate 21 at this event, the etching resist film 26 is left behind to the top face of the copper-plating layer 25 which should be made to remain as a circuit pattern.

[0033] Next, in a process (6), etching processing is performed that the copper-plating layer 25 and copper foil 23 unnecessary as a circuit pattern should be removed, and the etching resist film 26 which remains further on the circuit pattern formed in both sides of the copper-clad laminate 21 as mentioned above at the process (7) is exfoliated. Thereby, while a predetermined circuit pattern is formed in both sides of the copper-clad laminate 21, printed wired board PWB by which each circuit pattern was mutually connected through the copper-plating layer 25 formed in the inner circle wall of the primary hole 24 is obtained.

[0034] In the continuing process (8), multilayering of printed wired board PWB obtained as mentioned above is performed. In this multilayering process, being filled up with the inside of the primary hole 24 formed as mentioned above, Prepreg R is laminated by both sides of printed wired board PWB, and copper foil 30 is stuck on both sides of Prepreg R after this. Thereby, multilayer printed wiring board ML-PWB with which resin of Prepreg R was filled up in the primary hole 24 is obtained. Moreover, at a process (9), a through hole H is drilled in the predetermined part of multilayer printed wiring board ML-PWB through a drill, and it sets at a process (10) further. Like said process (3), after performing washing of the counter etching of a through hole H, and a hole wall, a copper-plating layer is formed in the inner circle wall of a through hole H, and the top face of each copper foil 30 with non-electrolytic copper plating. And the copper-plating layer 31 is further formed in the top face of the copper-plating layer formed by nonelectrolytic plating through electrolytic copper plating, and equalization of the thickness of the copper-plating layer 31 in a through hole H and the thickness of the copper-plating layer 31 formed in each copper foil 30 is attained. This state is shown in the process (10).

[0035] After a process (10) is completed, the predetermined circuit pattern P1 (refer to drawing 9) is formed in up-and-down both sides of multilayer printed wiring board ML-PWB through the copper-lating layer 31 by performing said each process (4) or the same process as (7) in a process (11). In addition, from the copper-plating layer 25 formed in both sides of said insulating layer 22 which exists in the inner direction of multilayer printed wiring board ML-PWB, the interlayer circuit pattern P2 (refer to drawing 9) is formed.

[0036] And secondary hole processing is performed that multilayer printed wiring board ML-PWB manufactured as mentioned above should excise the edge of the lap section which carries out a lap mutually in the primary hole 24 in a process (12). This secondary hole processing is the same as processing performed in said 1st example (refer to drawing 3). That is, it is carried out by forming a round hole C6 in order to excise each mutual lap section L of the primary hole 24 through a drill (it has a path thicker than the drill used for primary hole processing), and the secondary hole (through hole) 27 from which it comes to excise the lap section L by this is formed.

[0037] Thus, when performing secondary hole processing, resin of Prepreg R is filled up into the interior of the primary hole 24 with said multilayering process (8). There is no need of performing the separated process for being filled up with resin etc. in the primary hole 24 from this. Moreover, through resin of the prepreg R with which it filled up in the primary hole 24, weld flash etc. can arise

in the inner circle wall of the secondary hole 27, or it can prevent certainly that the copper-plating layer 25 exfoliates from the inner circle wall of the secondary hole 27.

[0038] Multilayer printed wiring board ML-PWB manufactured by passing through said each process (1) or a process (12) is explained based on drawing 9 . Drawing 9 is the perspective view of multilayer printed wiring board ML-PWB in which cutting and lacking a part of secondary hole 27 in multilayer printed wiring board ML-PWB, and showing it typically. [the copper-plating layer 25 formed at said process (3) in the inner circle wall of the secondary hole 27] By having excised the lap section L by secondary hole processing performed at said process (12), the four insulating sections 29 (only the one insulating section 29 is shown in drawing 9) are formed, and, as a result, the copper-plating layer 25 will be divided into four parts by the secondary hole 27. Therefore, the interlayer circuit pattern P2 by the copper-plating layer 25 which attends the inner circle wall of the secondary hole 27 is mutually insulated through each insulating section 29 at four places of the secondary hole 27. Moreover, the circuit pattern P1 is formed in up-and-down both sides of multilayer printed wiring board ML-PWB, and each circuit pattern P1 is mutually connected through the through hole H.

[0039] Four conduction passages (copper-plating layer 25) can be prepared by this in one secondar hole 27 (through hole) formed in multilayer printed wiring board ML-PWB. As a result, it sets to the interlayer of multilayer printed wiring board ML-PWB through one secondary hole 27. Since the interlayer circuit pattern P2 of four upper and lower sides each is mutually connectable, the occupying area which the number of the through holes which should be formed in multilayer printed wiring board ML-PWB is decreased on the whole, and a through hole occupies to multilayer printed wiring board PWB can be made very small.

[0040] As explained to the detail above [the manufacture method of said 1st example] While forming the primary hole 4, carrying out the lap of a part of both four breakthroughs to the double-sided copper-clad laminate 1 Since processing which forms the copper-plating layer 5 in the inner circle wall of that primary hole 4, excises the lap section L in the primary hole 4 after this, and forms the secondary hole 7 is performed, the four insulating sections 9 are formed in the copper-plating layer 5 and the copper-plating layer 5 was divided into four The circuit pattern P of four upper and lower sides each in printed wired board PWB is mutually connectable through each divided copper-plating layer 5. The occupying area which the number of the through holes which should be formed in printed wired board PWB is decreased on the whole, and a through hole occupies from this to printed wired board PWB can be made very small.

[0041] Moreover, after forming the primary hole 13, carrying out the lap of a part of both four breakthroughs to the three-layer laminate 10 which forms the circuit pattern Q1 in the interior by the manufacture method of said 2nd example, While giving the plating catalyst nucleus for no electrolyzing to the inner circle wall of the primary hole 13 The four insulating sections 17 in which processing which excises the lap section L in the primary hole 13, and forms the secondary hole 15 is performed, and a plating catalyst nucleus does not exist in the secondary hole 15 are formed. Then, since the copper-plating layer 16 was formed in the inner circle wall of the secondary hole 15 with nonelectrolytic plating Four conduction passages (copper-plating layer 16) can be prepared in one secondary hole 15 (through hole) formed in laminating printed wired board PWB. This result, Since the circuit pattern Q2 of four upper and lower sides each in printed wired board PWB is mutually connectable through one secondary hole 15.The occupying area which the number of the through

holes which should be formed in printed wired board PWB is decreased on the whole, and a through hole occupies to printed wired board PWB can be made very small. [especially each copper-plating layer 16 divided into four] The circuit pattern Q2 of both sides of laminating printed wired board PWB, and both the circuit pattern Q1 currently formed in the interior of a laminate 10 and each circuit pattern Q1 of both currently formed in the interior of a laminate 10 can be connected If the area in which circuit formation is possible can be increased by leaps and bounds substantially, and it puts in another way by increasing one layer of number of layerses in laminating printed wired board PWB and wiring density is the same, the number of wiring layers can be reduced by adopting the method of the 2nd example.

[0042] Furthermore, while forming the primary hole 24 by the manufacture method of said 3rd example, carrying out the lap of a part of both four breakthroughs to the double-sided copper-clad laminate 21 By sticking copper foil 30 on both sides of Prepreg R, form the copper-plating layer 25 in the inner circle wall of the primary hole 24, and after laminating Prepreg R to both sides of the double-sided copper-clad laminate 21, being filled up with the inside of the primary hole 24, constitute multilayer printed wiring board ML-PWB, and further Since processing which excises the lap section ' in the primary hole 24, and forms the secondary hole 27 is performed, the four insulating sections 29 are formed in the copper-plating layer 25 and the copper-plating layer 25 was divided into four It sets to the interlayer of multilayer printed wiring board ML-PWB through each divided copper-plating layer 25. [0043] which can make very small the occupying area which the interlayer circuit pattern P2 of four upper and lower sides each can be connected mutually, the number of the through holes which should be formed in multilayer printed wiring board ML-PWB from this is decreased on the whole, and a through hole occupies to multilayer printed wiring board ML-PWB In addition, as for this invention, it is needless to say for various improvement and deformation to be possible within limits which are not limited to said example and do not deviate from the summary of this invention. For example, in said each example, when forming the primary hole 4 and 13, it had composition which forms four round holes C1, C2, C3, and C4 fundamentally, but even if a round hole is not restricted to four and is two, three, or five or more, it is in ** that the same effectiveness as the above is acquired.

[0044]

Effect of the Invention] [this invention] by insulating the plating layer formed in a through hole inner circle wall by a very easy method, and dividing a plating layer into plurality as explained above Two or more circuit patterns of each formed in the top face of a printed wired board if it is in a double-sided printed wiring board, and two or more circuit patterns of each formed in an underside respectively separately independently Moreover, if it is in a multilayer printed wiring board, the manufacture method of a printed wired board of having a respectively separate mutually connectable independently through hole between the circuit patterns of up-and-down both sides and for between the circuit pattern of up-and-down both sides and an interlayer's circuit patterns can be offered, and the effectiveness which does so industrially is size.

[Translation done.]